I CLAIM

1. A one-way clutch for providing coupling between a first rotatable shaft having an axis of rotation, and a second, abutting, rotatable shaft having a co-axial axis of rotation, the one-way clutch being capable of coupling the shafts if the first shaft is rotated in an engaging direction relative to the second shaft but of uncoupling the shafts if the first shaft is rotated in a opposite, coasting direction relative to the second object, **characterised in that** the one-way clutch includes

   a) a first support frame, plate, or ring held upon the first shaft and supporting a first integer number **n**, greater than one, of pawl members each having a free end and a supported end separated by a rigid portion, each member being evenly spaced about a co-axial locus on a first end face of the first ring and the free end of each being directed towards a second support frame or ring,

   b) the second support frame, plate, or ring, held upon the second shaft and adjacent to the first ring and supporting a second integer number **m**, greater than one, of pockets each capable of receiving a free end of one of the members, each pocket being evenly spaced about a co-axial locus on a second end face of the second ring, each pocket being capable of reversibly engaging with an apposed member,

   c) ***wherein*** the numbers **n** and **m** are not the same, thereby raising the probability that at any moment the free end of any one member is closely adjacent in a rotational sense to one pocket, so that in use the amount of rotation required in the engaging direction before engagement of at least one member and adjacent pocket is reduced.

2. A one-way clutch as claimed in claim 1, **characterised in that** the numbers n and m are selected so that in use engagement of more than one set each comprising one pawl member and an adjacent pocket may occur at the same time in a symmetrical manner about the co-axial axis, thereby distributing the load between more than one set of members and adjacent pockets and minimising asymmetry of forces within the clutch.

3. A one-way clutch as claimed in claim 2, **characterised in that** the one-way clutch includes a resilient surface within the or each pocket against which a side of the member lies, permitting minor changes in the angle of rotation of the pawl member to occur when in the engaged position, so that relative dimensional imperfections are at least partially compensated and so that load sharing is facilitated between more than one engaged set.

4. A one-way clutch as claimed in claim 2, **characterised in that** the one-way clutch includes a resilient protrusion within the or each pawl member extending from a side of the member which protrusion, when in the engaged position, makes contact with a side of the pocket permitting minor changes in the angle of rotation of the pawl to occur when in the engaged position, so that dimensional imperfections are at least partially compensated and so that load sharing is facilitated between engaged pairs of pawls and pockets.

5. A one-way clutch for providing coupling between a first rotatable shaft having an axis of rotation, and a second, abutting, rotatable shaft having a co-axial axis of rotation, capable of coupling the shafts if the first shaft is rotated in an engaging direction relative to the second shaft but of uncoupling the shafts if the first shaft is rotated in a opposite, coasting direction relative to the second object, and in which a plurality of pawl members each having an axis of rotation, a first engaging face, and a second engaging face the faces being separated by a substantially rigid rod, are disposed about a first plate or annulus in a position wherein each may reversibly engage from time to time with a corresponding pocket disposed about a second plate or annulus in order to provide coupling, **characterised in that** a directionally dependent biasing means is applied to the or each pawl member of the one-way clutch, so that in use the or each member is biased to extend towards a corresponding pocket when the relative movement of the first and second rings of the one-way clutch occurs in the engaging direction, and is biased to retract away from a corresponding pocket when movement is in the coasting direction.

6. A one-way clutch as claimed in claim 5, **characterised in that** the directionally dependent biasing means comprises (1) a beam attached by a first end to and extending to one side of the rod of the pawl member, perpendicular to the axis of rotation of the pawl member, (2) a second, free end of the beam held in dragging contact with a side surface of the apposing plate or annulus, so that in use relative motion in the engaging direction will apply a turning moment of force, derived from the dragging contact, to the rod and cause the pawl member to swivel about the pawl axis of rotation and thereby become extended outwards towards a pocket located upon the apposing plate or annulus, whereas motion in the coasting direction will tend to cause the pawl member to become retracted.

7. A one-way clutch as claimed in claim 6, **characterised in that** the dragging contact is generated by a caster wheel mounted in rolling contact with the side surface of the apposing ring or plate, upon the free end of the beam.

8. A one-way clutch as claimed in claim 7, **characterised in that** an axis of rotation of the

caster wheel is not parallel to the axis of rotation of the one-way clutch so that, when in use, the amount of drag is increased.

9. A one-way clutch as claimed in claim 6, **characterised in that** the dragging contact is generated by a ball, supported within a cup, mounted in rolling contact with the side surface of the apposing ring or plate, upon the free end of the beam.

10. A one-way clutch as claimed in any one of claims 6 to 9, **characterised in that** the beam supporting the free end held in dragging contact with the side surface of the apposing plate or annulus exhibits resilience in a single axis so that, when in use, the free end is maintained in dragging contact with the surface.

11. A one-way clutch as claimed in claim 6, **characterised in that** the directionally dependent biasing means comprises a pattern of linear, slanting magnetised zones impressed into a ferromagnetically hard surface of an annulus bearing pockets, any one of the zones being capable of interaction with a ferromagnetic mass mounted rigidly and to one side of the pawl member in a position closely overlying the surface bearing the magnetised zones, so that in use motion in the engaging direction will tend to cause the mass to be attracted outwards and hence pull the pawl member outwards towards a pocket located upon the apposing ring, whereas motion in the coasting direction will tend to repel the mass and cause the member to be retracted.

12. A one-way clutch as claimed in claim 10, **characterised in that** the ferromagnetic mass is ferromagnetically hard and is magnetised in a pattern complementary to that of the surface of the ring.

13. A reversible one-way clutch for providing coupling between a first rotatable shaft having an axis of rotation, and a second rotatable shaft having a co-axial axis of rotation, capable of coupling the shafts if the first shaft is rotated in an engaging direction relative to the second shaft but of uncoupling the shafts if the first shaft is rotated in a opposite, coasting direction relative to the second object, **characterised in that** the one-way clutch includes a geared transmission providing reversible coupling and decoupling effected within a gear coupling, including a first gear and a second gear, the coupling being of a type wherein the transmission of power has a positive efficiency when power is transmitted through the gear coupling from the first gear to the second gear, but a negative efficiency when power is transmitted from the second gear to the first gear.

14. A reversible one-way clutch as claimed in claim 13, **characterised in that** the one-way clutch

includes a gear train turned by the first shaft; the gear train including a controllable amount of backlash or dead motion, the first gear of the gear train being supported on the incoming drive shaft; the gear train being supported on a rotatable frame attached to the second shaft and terminating with a worm screw in engagement with a worm wheel, the worm wheel being attached to the first shaft, wherein the gear train has a ratio such that in use the screw of the worm travels at the same speed as the teeth of the worm wheel, and wherein the controllable backlash is predetermined so that when the gear train is turned by the first shaft in a coasting or free-wheeling direction the turning screw of the worm passes in between the teeth of the turning worm wheel with substantially no frictional contact, but when the gear train is turned by the first shaft in an engaging direction the controllable amount of backlash temporarily interrupts the drive to the worm screw, so that afterwards the screw of the worm rubs against the teeth of the worm wheel thereby causing the rotatable frame to rotate and hence causing the second shaft to rotate.

15. A reversible one-way clutch as claimed in claim 13, **characterised in that** the controllable amount of backlash or dead motion is determined by controlling the amount of rotational clearance between at least one dog tooth and at least one dog of a loose dog clutch placed between the driving shaft and upon the first gear of the gear train.

16. A reversible one-way clutch as claimed in claim 13, **characterised in that** the direction of relative rotation for which the one-way clutch enters an engaged mode may be reversed by changing the orientation of the angular rotation, with respect to the first gear, through which the dog tooth may travel when in use.